



Collision Avoidance System

Mission Statement



“The Alaska Railroad Corporation will undertake a project to provide an integrated track control and communications system which authorizes trains, equipment and people to occupy track, moving safely and efficiently.”

August 1997

Corporate Information



The Alaska Railroad Corporation is a self-sustaining, full service railroad serving ports and communities from the Gulf of Alaska to Fairbanks.

Owned by the State of Alaska since 1985, the Railroad is overseen by a seven-member Board of Directors appointed by the Governor of Alaska.



COLLISION AVOIDANCE SYSTEM



OBJECTIVES

- PREVENT TRAIN TO TRAIN COLLISIONS BY ENFORCEMENT OF AUTHORITY LIMITS
- ENFORCE SPEED RESTRICTIONS
- PROVIDE PROTECTION FOR ROADWAY AND THEIR EQUIPMENT
- IMPROVE THE EFFICIENCY OF OPERATIONS
- INCREASE CAPACITY

COLLISION AVOIDANCE SYSTEM



GOALS:

- SAFETY

VITAL IMPLEMENTATION OF CLOSED LOOP SYSTEM

- OFFICE
- ON-BOARD

- OPERATIONAL EFFICIENCY

AUTOMATIC GENERATION AND DIGITAL
TRANSMISSION OF AUTHORITIES AND SPEED
RESTRICTIONS

VITAL SAFETY SERVER SEGMENT

MicroBlok



Servers

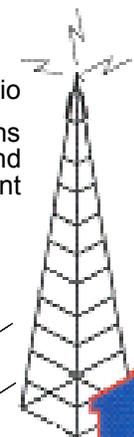


COMPUTER AIDED DISPATCH SYSTEM SEGMENT



Generate Mandatory Directives

Data Radio
- Provide Communications link between office and equipment



GPS



DGPS (Differential Correction)

COMMUNICATION SEGMENT



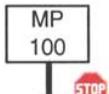
Position Reference



LOCOMOTIVE SEGMENT



Speed limit

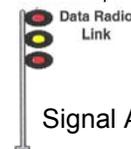


Authority limit

Location Reporting
Mandatory Directives with Enforcement



Track Integrity



Signal Aspect



Switch Position

WAYSIDE EQUIPMENT SEGMENT

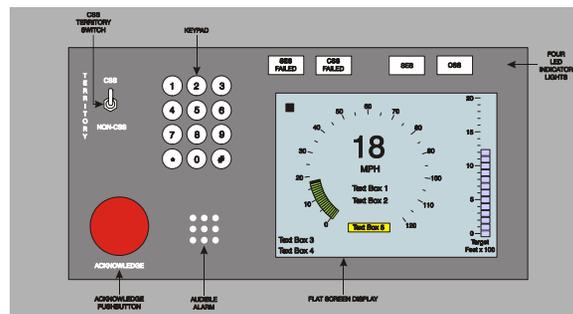
**System Overview
Trains**

Enforced Train Control

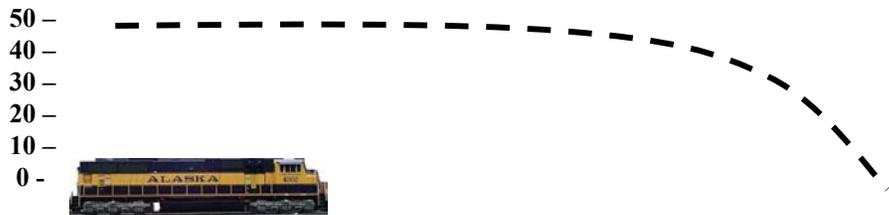
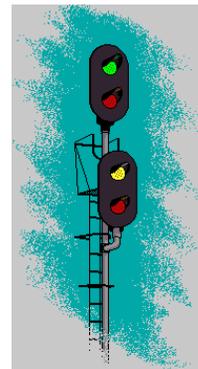
Concept of Operation: Continuous Speed Supervision



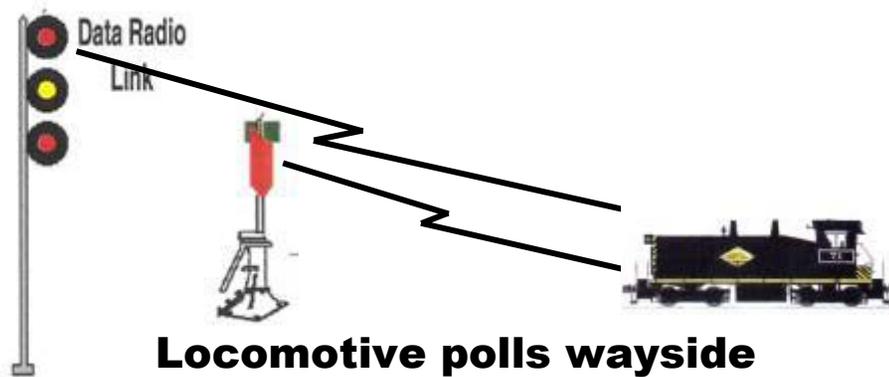
Computer



On-Board display



Speed and Distance/Evaluation/Brake



**Locomotive polls wayside
Wayside provides on-board data**

COMMUNICATION SEGMENT STATUS

VITAL SAFETY SERVER SEGMENT

MicroBlok



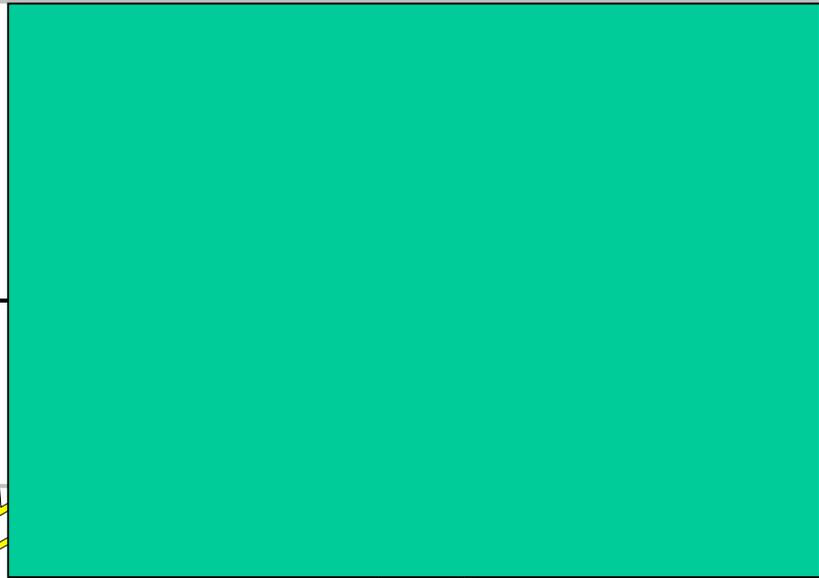
Servers



COMPUTER AIDED DISPATCH SYSTEM SEGMENT



Generate Mandatory Directives



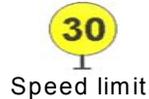
GPS



Position Reference



LOCOMOTIVE SEGMENT



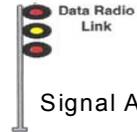
Speed limit



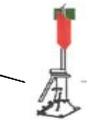
Authority limit



Track Integrity



Signal Aspect



Switch Position

WAYSIDE EQUIPMENT SEGMENT

System Overview
Trains

Data Radio and GPS Installation



VHF Antenna

GPS Antenna



Locomotive



Wayside

Fuel Sensor Installation

- Vent Pipe
- Conduit wire run

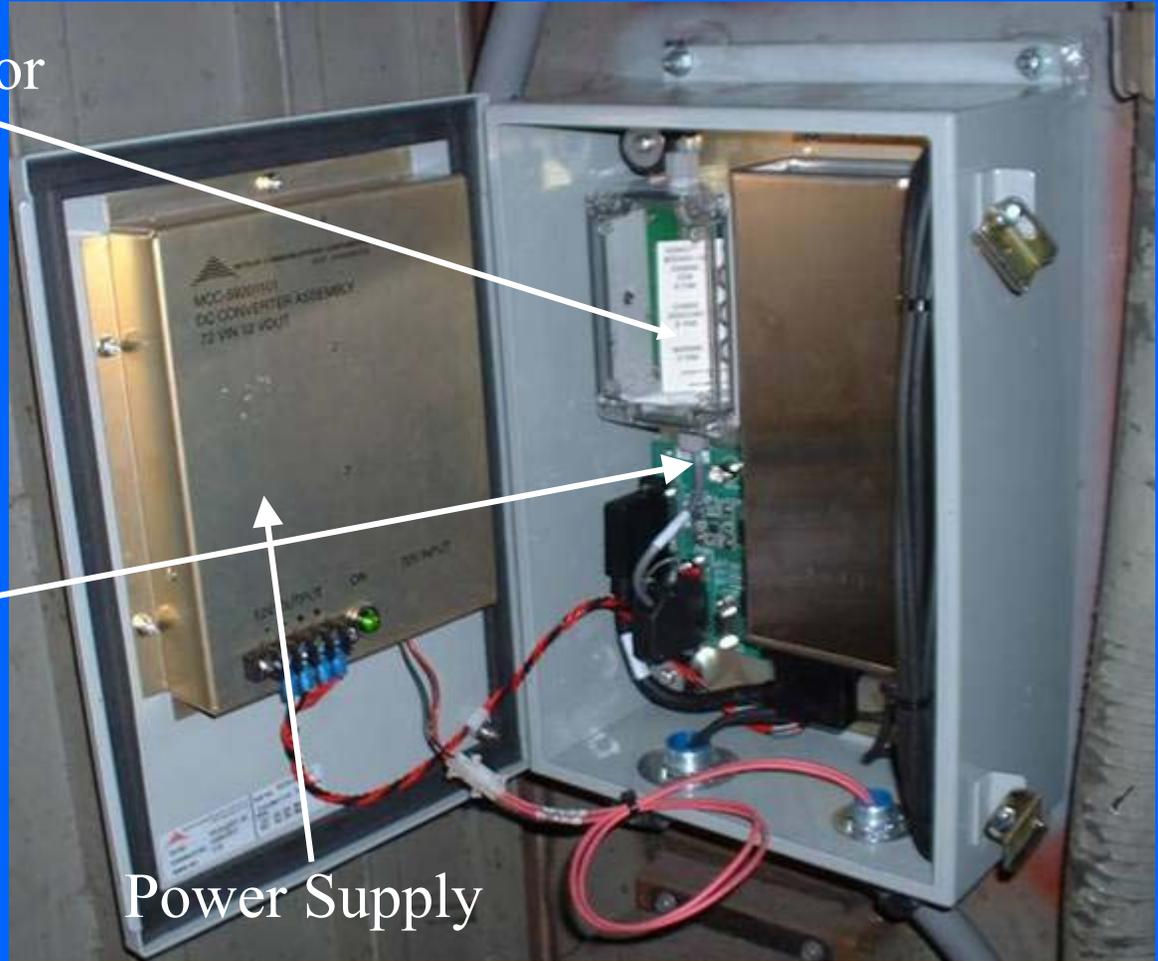


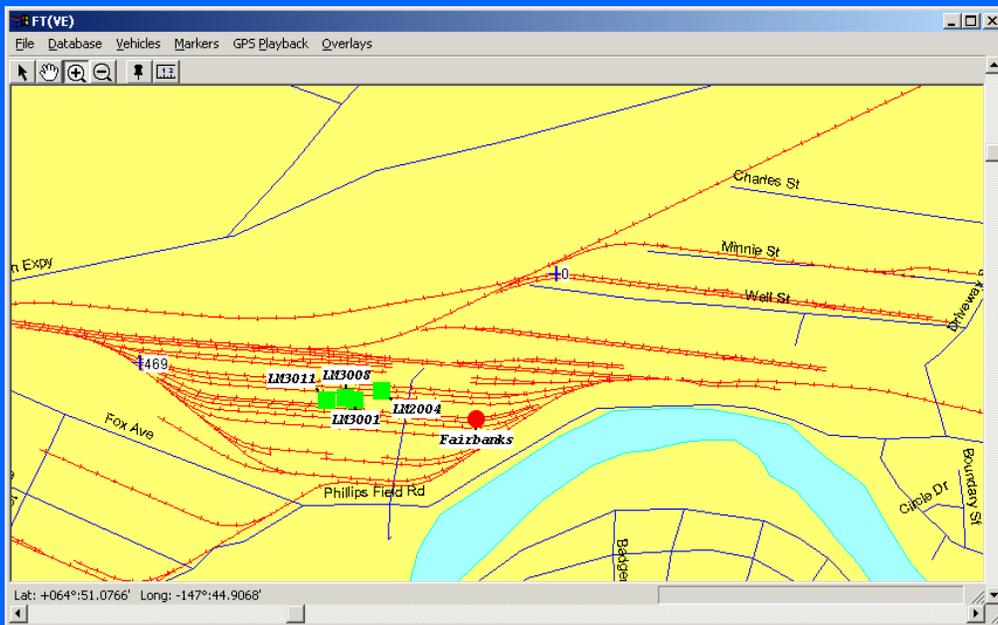
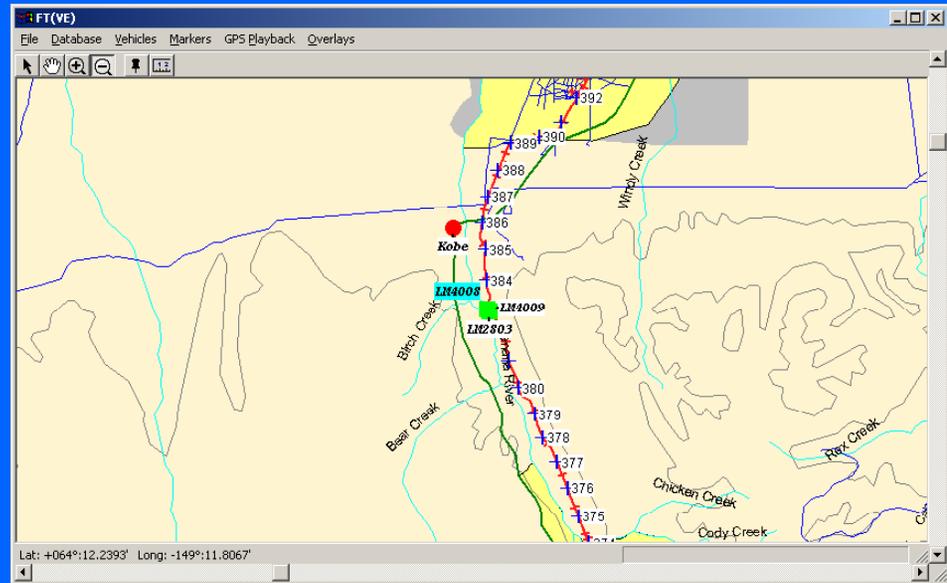
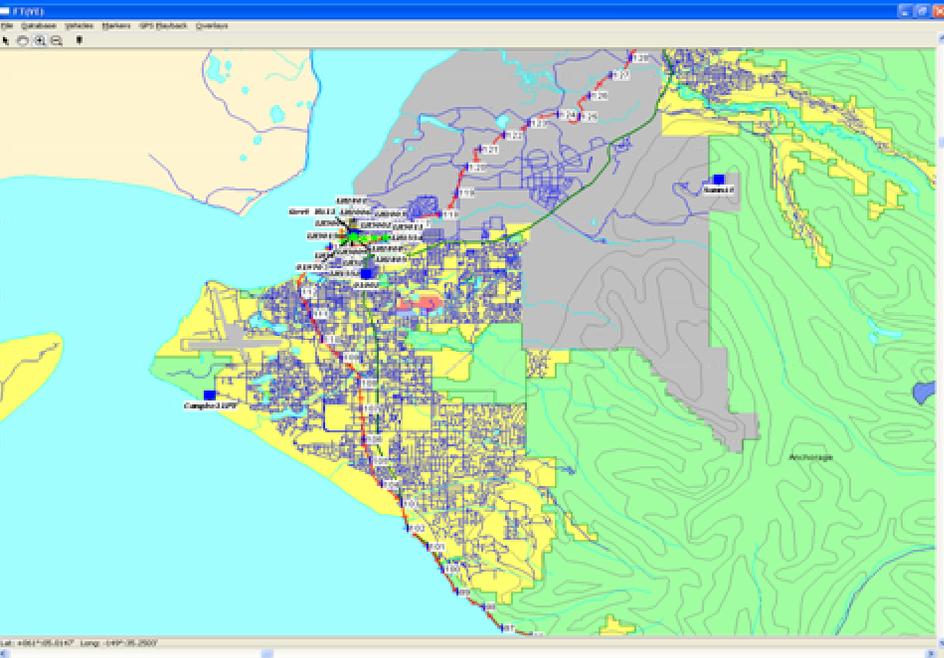
- Ease of installation
- Ease of maintenance

Fuel Sensor

MCC Radio

Power Supply

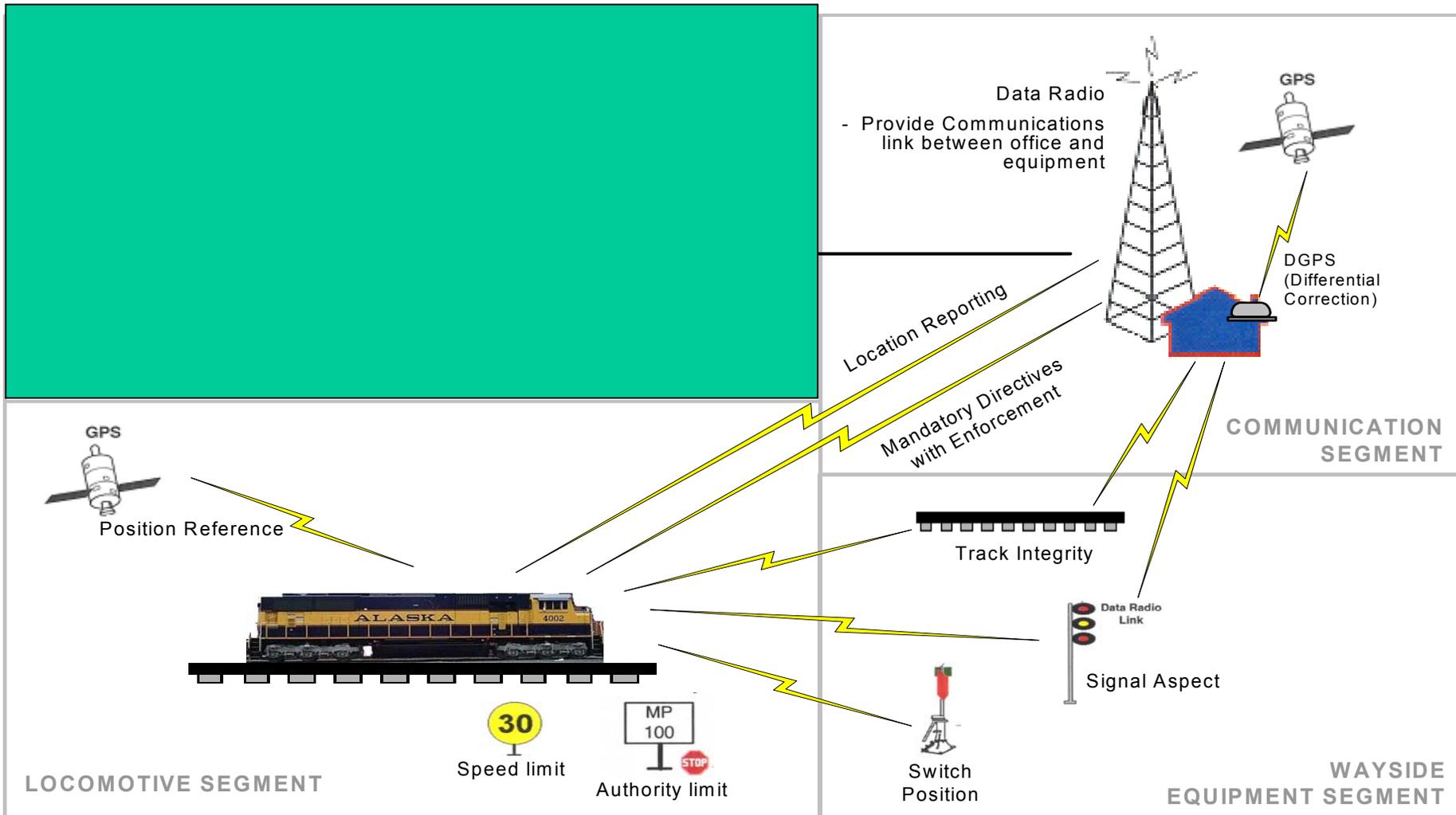




Dispatcher
Workstation Views:

- High Level
- Intermediate
- Detail

CAD SYSTEM SEGMENT



System Overview
Trains

LOCOMOTIVE SEGMENT STATUS

VITAL SAFETY SERVER SEGMENT

MicroBlok



Servers

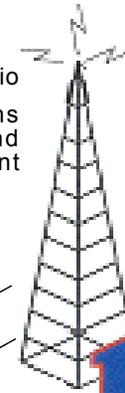


COMPUTER AIDED DISPATCH SYSTEM SEGMENT



Generate Mandatory Directives

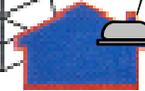
Data Radio
- Provide Communications link between office and equipment



GPS



DGPS (Differential Correction)



Location Reporting

Mandatory Directives with Enforcement

COMMUNICATION SEGMENT



Track Integrity



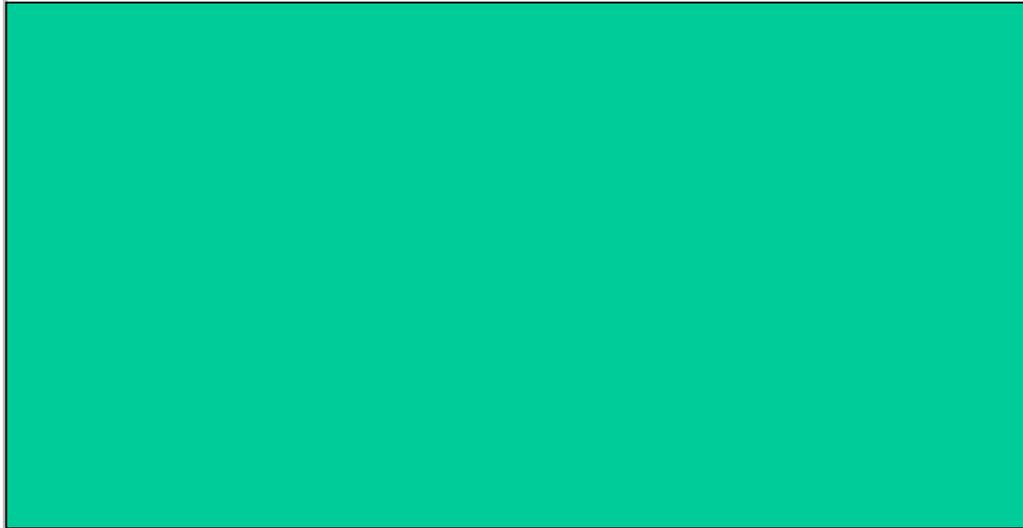
Data Radio Link

Signal Aspect



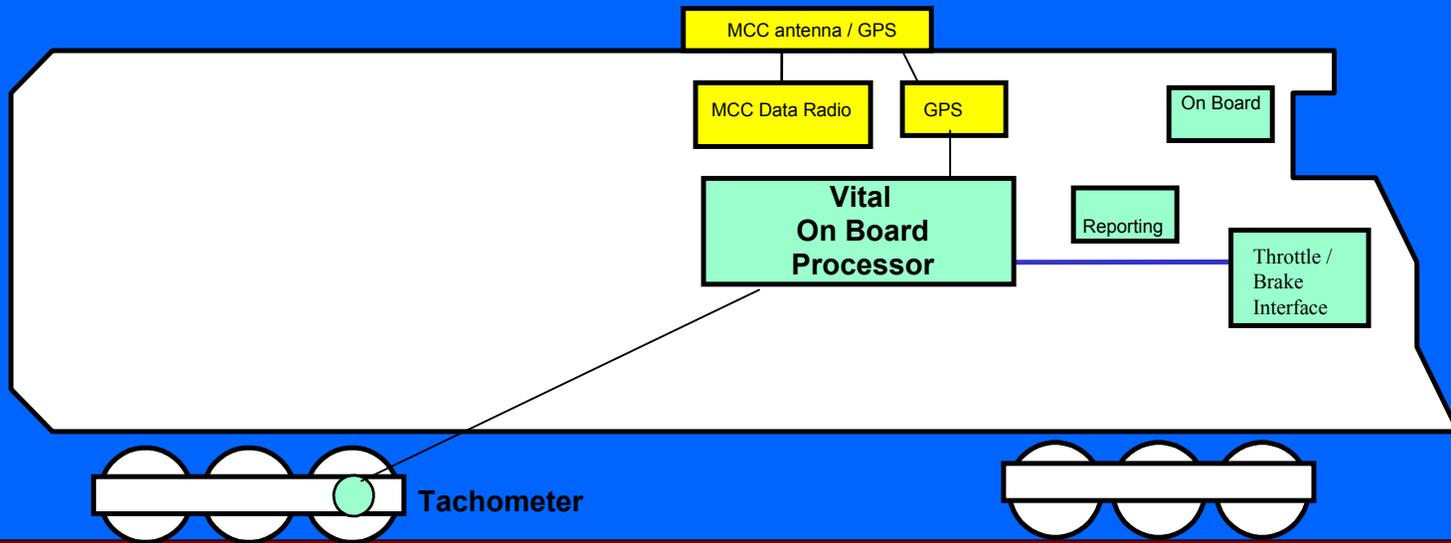
Switch Position

WAYSIDE EQUIPMENT SEGMENT



System Overview
Trains

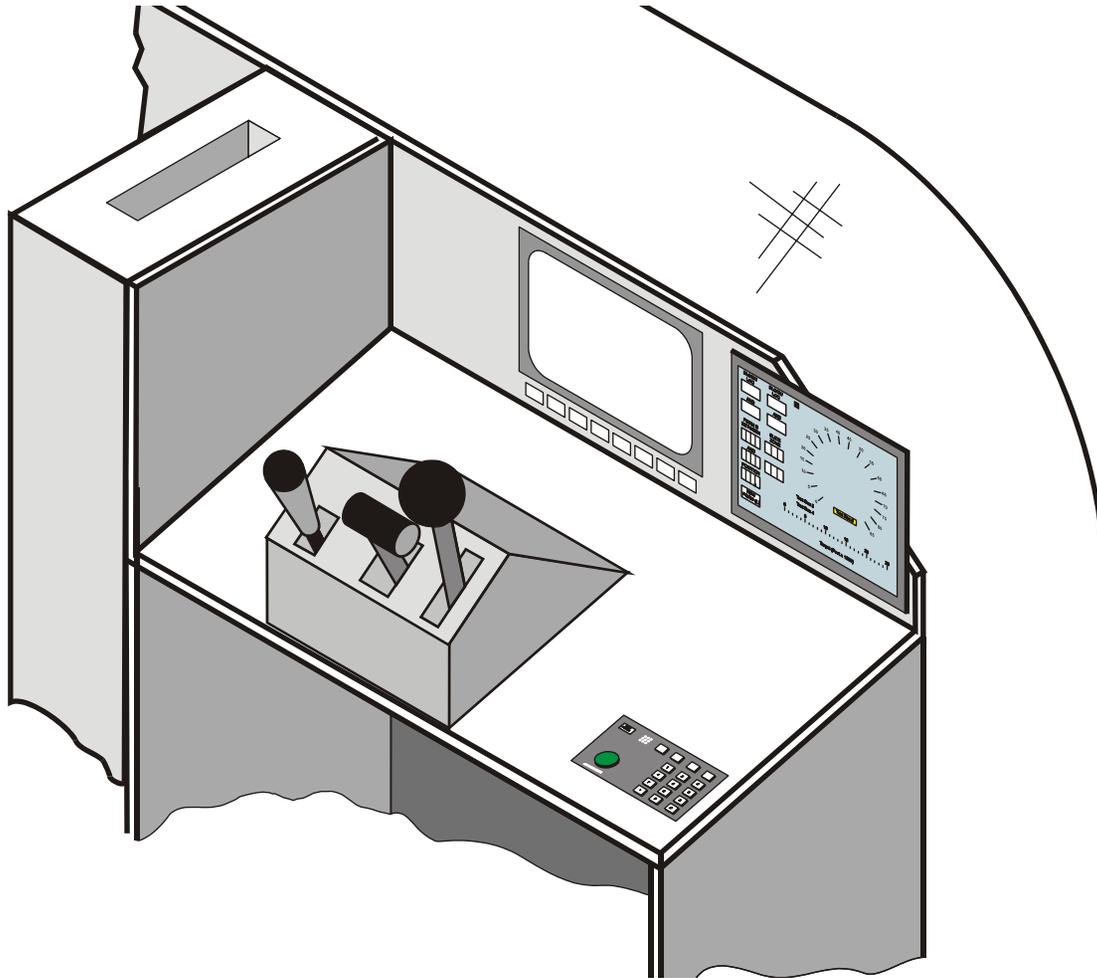
On-Board Equipment



| Operational Functionality | |
|---------------------------|---|
| Phase 1 | <ul style="list-style-type: none"> - Locomotive Tracking - Fuel Level Monitoring |
| Phase 3 | <ul style="list-style-type: none"> - On-board data base - Electronic Delivery of Mandatory Directives - On-Board Display - Throttle / Brake Interface - Vital Processor - Safety Critical Operation |

| Benefits |
|---|
| On-Board Authority Enforcement |
| On-Board Speed Enforcement |
| Roadway Worker Protection |
| Reduction of Mandatory Directive Errors |

CAS "CLEAN CAB" INSTALLATION

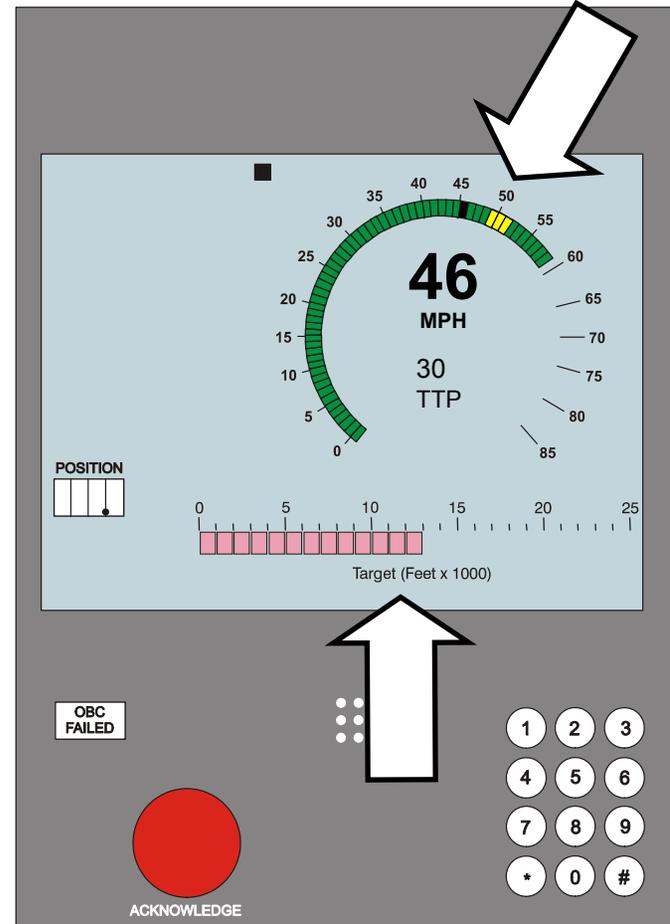


CAS Locomotive Display Unit (LDU)

Approaching new “target” speed

Note: Authorized speed 59 mph (clear)

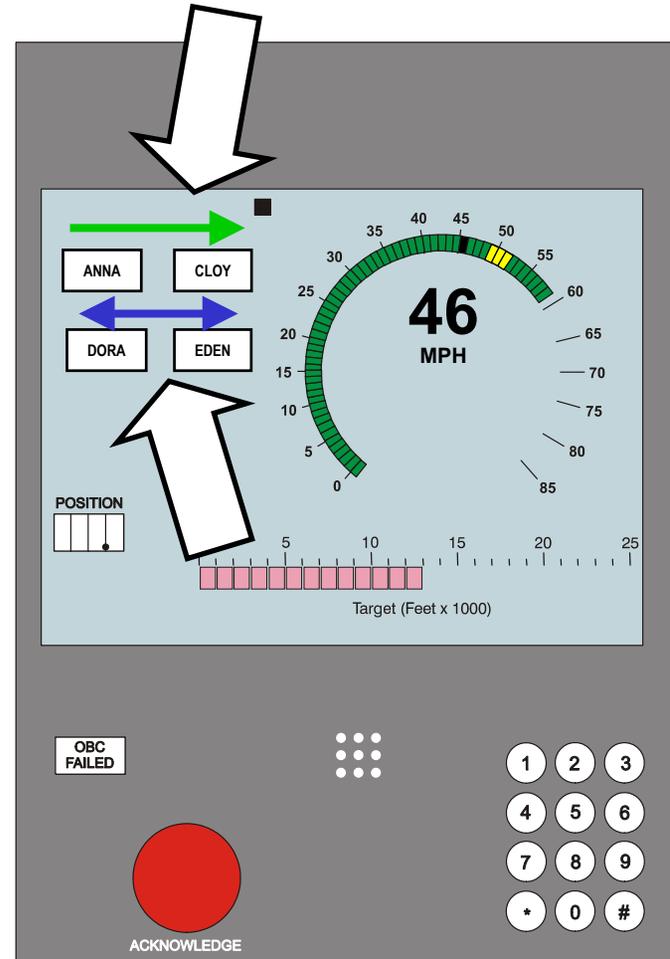
- 3 flashing yellow segments indicates restriction ahead
- Distance to restriction (target distance) greater than TBD ft indicated by distance to target display of magenta to TBD feet
- Time to Penalty in seconds to target



CAS Locomotive Display Unit (LDU)

Authority Limits:

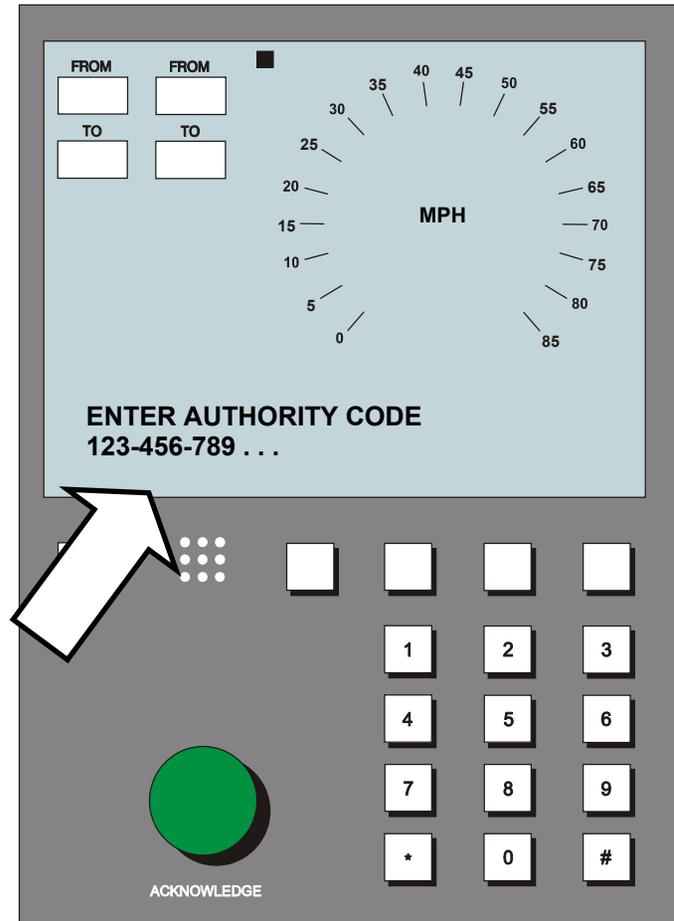
- Directional
 - Anna to Cloy
- Bi-Directional
 - Between Dora and Eden



CAS Locomotive Display Unit (LDU)

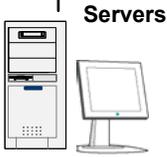
Data Radio Network Failure

- Mandatory Directives will be manually input to OBC by the engineer.
- The dispatcher will read the authority code in a numerical format consisting of groups of three numbers: 123-456-789 ... including a CRC.
 - Numbers are displayed on the screen as engineer inputs them.



VITAL SAFETY SERVER SEGMENT

Vital Office Server
MicroBlok

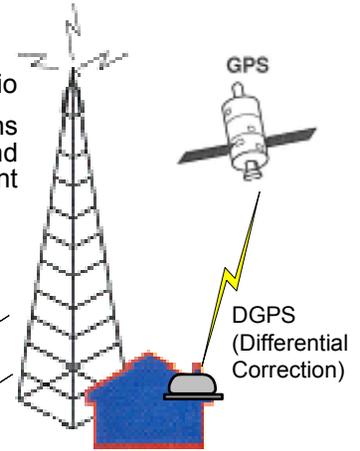


COMPUTER AIDED DISPATCH SYSTEM SEGMENT



Generate Mandatory Directives

Data Radio
- Provide Communications link between office and equipment

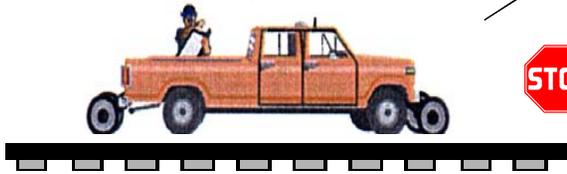


Location Reporting
Mandatory Directives Digitally Transferred

COMMUNICATION SEGMENT



Position Reference



MP 100

Authority limit

WAYSIDE EQUIPMENT SEGMENT

ON TRACK EQUIPMENT SEGMENT

System Overview
On Track Equipment

Project Timeline

